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ABSTRACT

This study examined differences and similarities in first-year college retention among Anglo, Black, and Hispanic students. Data were gathered on nearly 3,000 new undergraduate students who entered Barry University in Miami Shores, Florida, between 1991 and 1995, including full-time, part-time, and transfer students. Data included demographic information, standardized test scores, academic performance at previous institutions, and academic performance at Barry University. The students also completed two surveys during their first year on their subjective experiences at the university. The study found that first-year grade point average (GPA) had a far greater impact on the odds of retention than any other factor, contributing 81 percent to a predictive model of retention. Taken together, variables interacting with ethnicity or citizenship contributed less than seven percent to the retention model. It was also found that Black students had 50 percent greater odds of persistence assuming all other factors being equal. Only Black and Hispanic students' GPAs were affected by satisfaction with opportunities for academic help outside of class, while concerns about financial difficulties affected persistence only for resident aliens, regardless of ethnicity. (Contains 45 references.) (MDM)

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Comparing Retention Factors for Anglo, Black, and Hispanic Students

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Abstract

As student ethnic diversity increases, we must understand the extent to which the groups take different paths to success in college. This paper explores differences and similarities, by citizenship status, among Anglos, Blacks, and Hispanics in terms of factors correlated with first–year retention. Four years of undergraduate data at an ethnically diverse, urban university provide the evidence for a logistic regression analysis. Academic success dominates the retention decision similarly for each group. Also there are no distinctions among groups in the way in which social and psychological integration affects attrition. However, previous college experience has a different impact for Blacks, only Blacks' and Hispanics' grades are impacted by satisfaction with opportunities for academic help outside of class, and concerns about financial difficulties affect persistence only for resident aliens regardless of ethnicity. By understanding differences, we can retain the ethnic diversity initially invited in recruiting minority students.

Purpose

As our student populations become more diverse — by ethnicity, age, academic preparation, etc. — we must no longer blindly treat the student body as if all students were cut from a single cookie cutter mold. Different groups may take different paths to successful completion of college, and they may be impacted differently by the factors that influence student retention and academic achievement. By understanding the extent to which factors impact different groups, an institution can tailor retention strategies to address each group's special circumstances. In this way we can preserve the ethnic diversity we initially invited in recruiting students.

This paper compares and contrasts the factors correlated with first-year retention for Anglo, Black, and Hispanic students, by citizenship category, at a private, urban university. It is a well established concern that Black and Hispanic students have higher dropout rates nationally. Do all groups face the same "risk" factors, and which risks are more prevalent among students from these minorities? Or do different groups face different risk factors? Because Barry University is so ethnically diverse, it allows us to explore how these groups respond to essentially the same environment. In contrast, the literature has focused more on the retention of minorities in traditionally Black or Hispanic institutions or alternatively in institutions in which they are a tiny fraction of the student body. These studies have not allowed us to separate the impact on retention of differences among institutions from the differential impact of ethnicity.

Review of the Literature

This portion of the paper offers a brief review of the literature on retention and attrition in higher education. The discussion starts with an overview of the problem, i.e., the need for theoretical models predictive of retention and attrition among college students; it continues with

a description of the work of Tinto and Bean, pioneers in this field of research. The final section reviews modifications of the models proposed by Tinto and Bean.

Need for Theoretical Models

In 1972 the National Longitudinal Survey of the High School Class of 1972 indicated that nearly 60% of every 100 first-time entrants to the four year college would leave their first institution of registration without completing their degree program (Eckland and Henderson, 1981). Of this number approximately 29 would leave higher education permanently. The remaining 31 would transfer to other institutions of higher education immediately or "stop-out" and re-enter after some interval. In other words, out of every 100 entrants, nearly 65 would eventually earn a degree and approximately 44 would do so from the institution of initial entry.

Tinto (1985) notes that some students leave college involuntarily; i.e., because of grades or some other problem with the institution. However, he notes that approximately 85% of withdrawals are voluntary. The failure to distinguish between voluntary and involuntary withdrawal, permanent from temporary has, according to Tinto (1975), led to inaccurate estimates of withdrawals in higher education. It is Tinto' s contention that this lack of precision leads to inappropriate policy decisions. He also contends that the lack of a theoretical, longitudinal model disallows researchers from isolating the significant factors that lead to the decision to withdraw. Knowing that students leave is insufficient. Policy makers need to know why students leave.

Bean (1980) quotes Summerskill, who reviewed 35 different studies of student attrition between 1913 and 1962 and found that the median loss of students was 50%. From his review of studies conducted in the 70's Bean concludes that attrition statistics remain fairly consistent. Bean concurs with Tinto on the need for a conceptual model that investigates the determinants of student attrition.

Institutions of higher education do need to know why students leave their campuses; if not to provide a more congenial climate for student learning and success, then certainly for institutional survival.

Proposed Models

Tinto's theoretical model premises student dropout as a longitudinal process of interactions between the individual and the academic and social systems of the institution of higher learning. In other words, it is the student's experiences in these two systems that continually modify his goal commitment and institutional commitment which, in turn, affect the decision to persist or leave (Tinto, 1975).

Tinto draws from Durkheim's theory of suicide in developing his model; he posits a similarity in the factors that lead to suicide with those that lead to withdrawal from college, i.e., insufficient moral and social integration. The former is a result of holding highly divergent values from those of society; Tinto, following the insight of Spady, likens this to the inability to integrate into the moral and academic climate of the institution. The latter corresponds to failure to integrate into the social systems of the college (Tinto, 1975).

Tinto's model also draws upon the cost benefit theory of economics. A student is constantly analyzing the benefits of investing time and monies into education against alternative forms of personal investment. This analysis processes the cost of staying against the benefit in the light of future employment, social status, personal satisfaction, etc. The cost and benefits analysis is impacted by the student's social and academic integration into the institution; both affect his personal goal commitment and institutional commitment.

Essentially Tinto's model, called the Student Integration Model by researchers, hypothesizes the decision to persist or to leave as complex series of interactions between goal commitment (intention to persist), and institutional commitment (identification with moral and academic

climate of the institution), which respectively influence academic and social integration, the significant factors in the decision. The model accepts the research findings that family background, e.g., social and economic status, parent support and expectations, as well as previous schooling as measured by GPA, are factors impacting goal commitment and institutional commitment. The measures of academic integration are grade performance and intellectual development as perceived by the student; social integration is measured by peer-group and faculty interactions.

In summary the Student Integration Model emphasizes students interactions within the college environment, both social and academic, as the factors influencing attrition. The theory hypothesizes that persistence is a function of the match between an individual's motivation and academic ability and the institution's academic and social characteristics. The coincidence of this match shapes the individual's commitment to complete college (goal commitment) and his commitment to the respective institution (institutional fit). The stronger these commitments the more likely is the decision to persist (Cabrera, Castaneda, Nora & Hengsler, 1992).

Tinto did not test his model; however, in their test of the model, Terenzini and Pascarella (1978) confirmed that precollege traits were not significantly related to attrition and that integration into the academic systems of the institution may be more important than involvement in social systems. They observed that, after all other variables have been controlled, stayers reported more frequent contact with faculty, found the academic program more exciting and enjoyable as well as enlightening and provocative.

Terenzini and Pascarella did observe differences in responses between white students and black students. For example, the amount of self-perceived progress in intellectual development appeared virtually unrelated to attrition among minority students, but was strong among non-minority students. Also affective appeal was more contributive to stayers among minorities than among non-minorities. In their conclusion these researchers suggested that attrition reduction

efforts needed to focus on what happens to students in academic areas after they arrive on campus.

Bean (1980) noted the inadequacy of the Tinto model in that it did not distinguish between the determinants of student attrition (analytic variables) and correlates of student attrition (demographic variables). This failure to distinguish rendered the model unsuitable for path analysis to test causal links. Bean proposed a causal model of student attrition, adapted from Price's theory of employee turnover in work organizations. The basic assumption is that students leave institutions of higher learning for reasons analogous to those that cause employees to leave work organizations. The model contains the dependent variable, dropping out; the intervening variables are: satisfaction and institutional commitment, organizational determinants and background variables.

Bean found that the background variables, socioeconomic status and GPA, positively affected goal commitment and university GPA. These organizational determinants, along with intellectual development, practical value, institutional quality, institutional integration and communication, staff/faculty relations, campus work, major area and major certainty, and campus organizations positively influenced satisfaction. Satisfaction was positively related to institutional commitment which showed an inverse relationship to dropping out.

As tested, Bean's 1980 model accounted for 21 percent of the variance for females and 12 percent of males. Institutional commitment was the most important variable for both men and women. The opportunity variables (opportunity to transfer, to get a job, remain as a dependent at home) were significant in determining institutional commitment and opportunity to transfer had the highest path coefficient for those variables significantly related to institutional commitment for women.

In 1982 Bean proposed a revised model, containing ten rather than twenty-three (23) independent variables. Background variables were excluded. Based on the effects coefficients,

the overall ranking of the independent variables in influencing dropout were, in descending order: intent to leave, grades, opportunity to transfer, practical value, certainty of choice regarding institutional fit, loyalty to institution, family approval, courses, student goals, certainty of major and job certainty.

Intent to leave, measured by the student's response to the question of returning the next semester or the next year, showed a negative relationship to the three attitudinal variables: loyalty, certainty of choice of institution, and practical value. In this study Bean divided his sample into four groups: high-low confidence women and high-low confidence men. While intent to leave and the three attitudinal variables were significant for each group, the effects of the remaining variables on attrition differed among groups, thus illustrating the complexity of establishing causal relationships to explain attrition (Bean, 1982).

In his 1985 explanatory model Bean posited "drop syndrome" as the dependent variable, which is defined as "a conscious, openly discussed intention to leave coupled with actual attrition". By thereby controlling the variable "intent to leave", he was better able to isolate the independent variables influencing attrition. In this model academic, social-psychological and environmental factors (exogenous variables) are expected to influence the socialization/selection process; the socialization/selection process influences the endogenous variables: college grades, institutional fit, and institutional commitment. The endogenous variables are expected to influence the dropout syndrome (Bean, 1985).

The results of the study supported previous research in demonstrating that socialization is a dominant force in affecting dropout decisions. The study found that social life has large significant effects on institutional fit and that the attitudes of peers have a much greater effect than those of faculty. Bean concludes that peer support is an important element in the retention of students (Bean, 1985).

Cabrera, Castaneda, Nora, and Hengstler (1992) note that the models of Tinto and Bean have many common elements: both claim that persistence is the result of a complex set of interactions over time; both argue that precollege characteristics affect how well students adjust to their institutions, and both agree that persistence is an effect of the successful match between student and institution, i.e., what Tinto labels institutional commitment corresponds to institutional fit in Bean's Student Attrition Model (SAM). One difference lies in the emphasis that the Student Attrition Model places upon the role external factors: family approval, encouragement of friends, finances, perceptions about opportunity to transfer, play in shaping attitudes and decisions. In addition, Tinto's Student Integration Model regards academic performance as an indicator of academic integration while Bean's Student Attrition Model considers it an outcome variable resulting from social-psychological processes.

Cabrera, et.al., tested the two models for their predictive quality and validated the finding that college persistence is the product of a complex set of interactions among personal and institutional factors. The hypothesis that intent to persist is the outcome of a successful match between student and institution was likewise supported. Tinto's Student Integration Model appeared the more robust of the two models when judged in terms of the number of hypothesis validated; however, Bean's Student Attrition Model accounted for more variance in both Intent to Persist and Persistence. This finding is attributed to Bean's proposition that the role external factors play is far more complex and comprehensive than the Student Integration Model purports (Cabrera, Castaneda, Nora & Hengstler, 1992). The role of external factors, especially Encouragement from Significant Others, was validated by Nora. (Nora, 1991)

Building upon their previous research on both models (SIM & SAM) on the Student Integration Model and Student Attrition Model, Cabrera, Castaneda, and Nora (1993) constructed a baseline model that incorporated both theoretical frameworks. The variables included were those validated by testing the two models. The exogenous or environmental

variables were: encouragement from family and friends, and finance attitudes (I am satisfied with the amount of financial support, e.g., grants, loans, family, job, I have received.). The endogenous variables were: academic integration as revealed by student satisfaction with courses, evaluation of personal performance and academic experiences; academic performance, social integration, institutional commitment, and goal commitment.

When tested the integrated model supported the structional relationships hypothesized by Tinto and Bean between academic and social integration factors as well as those among commitment factors. Support was also found for the role of external factors in facilitating the integration of the student into the academic scene and in maintaining institutional commitment (Cabrera, Castaneda & Nora, 1993).

Retention/Attrition Research with Non-Traditional and Ethnic Students

Both the Student Integration Model and Student Attrition Model have been hypothesized and tested in four-year institutions of higher education with traditional students: 18-24, residing on campus, attending full time. Yet research indicates that enrollment of non-traditional students i.e., those who commute, are 25 or older, do not attend full time, has greatly increased and in some institutions constitutes the majority (Bean & Metzner, 1985). The differences between the traditional and non-traditional student are significant in studying the causes of attrition. Typically the non-traditional student is older, more mature, self-directed, and pragmatic. For this student the social environment of the institution is less significant and academic concerns are paramount; there is less interaction with faculty and students and much greater interaction with the non-collegiate, external environment. (Bean & Metzner, 1985)

Bean and Metzner present a conceptual model for explaining attrition among nontraditional students. Based on the stereotype of the non-traditional student, the model presumes that socialization in the college environment is not important and that socialization in the external

environment is. The model proposes that dropout decisions are primarily based on four sets of variables: (I) poor academic performance; (2) intent to leave, influenced by psychological outcomes (utility, satisfaction, goal commitment and stress) as well as by academic variables; (3) background variables: primarily high school performance and educational goals; and defining variables, i.e., age, enrollment status, sex, ethnicity and residence; (4) environmental variables: finances, hours of employment, outside encouragement, family responsibility, and opportunity to transfer. Intent to leave is used in this model in place of institutional commitment, because research suggests redundancy when both are included; also, intent to leave is more accurate for short term students and is a very strong predictor of attrition even when institutional commitment is controlled.(Bean & Metzner, 1985)

The model hypothesizes that when environmental and academic variables are both good, i.e., favorable for persistence, students should remain in college; when both are poor, the student should leave; when academic variables are good but environmental variables are poor, the student should leave; conversely, when academic variables are poor but environmental variables are good, the student is expected to stay. Bean and Metzner admit the tentative nature of this model and propose it primarily as a framework for further study with non-traditional students (Bean & Metyzner, 1985).

In his study Nora (1987) tested a modified version of Tinto's Student Integration Model on a Chicano student population in two-year colleges. Exogenous variables included were: high school grades, parents' education and encouragement by significant others; endogenous variables were academic integration, social integration, institutional/goal commitment and the dependent variable, retention. The results of the test indicated that academic and social integration did not have significant direct effects on retention as was reported by other researchers testing Tinto's model. Furthermore, Tinto emphasized the importance of initial institutional and goal commitment on retention but only when they were mediated through

academic and social integration. However, in Nora's study, institutional and goal commitment not only had a direct effect on retention, but were also considerably more important in determining retention (Nora, 1987).

In testing the fit of this model, Nora established that the precollege variables, grades and encouragement explained 20% of the variance in institutional commitment; that the endogenous variable, institutional commitment, explained 42% of the variance in academic integration, and finally, that the two exogenous variables and the one endogenous variable accounted for 24% of the variance in social integration. Essentially Nora's research reflected the overall strength of his hypothesized model; it was not entirely supportive of Tinto's model (Nora, 1987).

In her work analyzing factors affecting Hispanic student transfer behavior, Kraemer (1995) noted that nationwide, one-fourth of all community college students are minorities; furthermore, these students have the lowest retention rates and the highest transfer losses. Nora and Rendon (1990) indicated that although 80 percent of Hispanic community college students express the desire to transfer to a four-year institution, national transfer rates for Hispanics and for most minorities, remain between 5 and 20 percent. Significant variables explaining transfer behavior in Kraemer's study were: mathematic ability, academic achievement, and intent to transfer. Since transfer is a form of persistence the significance of these variables can perhaps be extrapolated to the analysis of retention in Hispanic students.

The Nora and Rendon study (1990) of Hispanic community college students examined their "predisposition to transfer". The model supported the fact that a high degree of congruence between student and environment led to a predisposition to transfer. All five factors in the model: parents' education, encouragement, initial goal and institutional commitments, social integration and academic integration were significant and together explained 65 percent of the variance.

Grossman, Dandridge, Nettles and Thoeny (1983) cite attrition studies that show that more blacks than whites drop out of college, particularly after the first and second years. Blacks are also more likely to engage in part-time employment and interrupted schooling, resulting in significantly lower four-year completion rates. In their study of student retention Grossman, Dandridge, Nettles and Thoeny (1983), focused on the relationship between race and student progression. They tracked students' progress from entry to degree completion by comparing those who left school with those who remained, thereby looking at both attrition and retention behaviors. They also compared different groups of students in terms of persistence and dropping out behaviors.

This study isolated the following variables as significant in predicting attrition and progression in college: mean SAT score, mean family income, type of institution, financial aid, and race. The study concluded that low attrition for blacks could be attributed to high SAT scores, high family income, attendance at a predominantly black institution. The study also revealed that racial differences in performance disappeared when other student and institutional characteristics were accounted for through multiple regression techniques. Differences were explained by variables other than race (Grossman, Dandridge, Nettles and Thoeny, 1983).

In another study of student attrition, Mallinckrodt (1988) found that student perceptions of social support and the intent to leave were significant predictors of persistence for both black and white students. However, white students looked to family for support whereas black students sought support from the campus community. The limitations of this study were noted: small sample of traditional undergraduate students

The results of Nelson' s study (1994) are reminiscent of the Mallinckrodt finding that persistence is causally related to support from the campus community. While Mallinckrodt does not define campus support in terms of students, faculty, and services, Nelson explicitly relates

campus support to academic assistance, personal counseling, social enrichment and career counseling. Reporting from previous studies, Nelson describes the freshman dropout as one who: did not receive intrusive academic counseling, did not attend tutorial sessions, did not tend to participate in social activities, did not use academic facilities, and did not participate in student union activities. Nelson notes that African-American students who persist generally utilized campus support services.

Bennett and Okinaka (1990) adapted Bean's 1982 student attrition model to construct a conceptual model of black student attrition. This conceptual model was tested in 1982 and revised in 1985. Independent variables included in this model seem to reflect research findings supporting a positive correlation between social integration and retention. These variables are: pre-college positive inter-racial contact, positive collegiate inter-racial contact, amount of pre-college and college inter-racial contact, membership in ethnic organizations, friends on campus, opportunities on campus to help, openness to human diversity, and college adjustment. The latter variable replaced feelings of trauma or alienation used in the 1982 study. Analysis of the college adjustment items (25) yielded four factors: (1) PREPAREDNESS, degree to which a student feels prepared, (2) INSTRUCTORS, perceptions of instructors, (3) RELATE, the way students perceive their social relationships on campus, and (4) ACCOMPLISH, student's sense of accomplishment. The criterion variable in the 1985 study was persistence, whereas the 1982 study used intent to leave. The sample for the 1985 study was the same group used in 1982, i.e., the persisters and non-persisters of the 1982 freshman class.

Data revealed persistence rates of 73% for Asian students, 79% for whites, 35% for Blacks, and 48% for Hispanics. Regression analysis of model variables indicated that college grade point averages were not significant predictors of retention for Asian and white freshmen but were significant predictors for Black freshmen. The negative relationship between the factor RELATE (how students perceive their social relationships on campus)and persistence of Black freshmen

was unexpected. In other words, those freshmen who felt the most alienated or negative about their social relationships were most likely to be persisters. Among Black freshmen those who felt most prepared for college also felt the least satisfied with the social environment on campus but attained the highest GPA. These findings suggest that Black students who feel the least alienated in terms of the factor PREPARE will persist even though they feel the most alienated in terms of RELATE (Bennett and Okinaka, 1990).

Consistent with this finding is the indication that Black students who belong to a predominantly Black organization felt most dissatisfied with campus social environment, yet those students who valued this membership most highly felt most prepared for college. A comparison of the degree of satisfaction expressed by Black freshman and that expressed by Black seniors or persisters seems to suggest that experiences on campus increased the sense of alienation. Black seniors expressed greater alienation than Black freshmen. Black students who experienced the most positive interracial contacts on campus felt most positive about their social relationships and instructors. Positive pre-college interracial contacts predict positive collegiate interracial contacts as well as openness to human diversity, i.e., attitudes about interracial dating and marriage, and attitudes about equity policies (Bennett and Okinaka, 1990).

The model tested by Bennett and Okinaka shows that satisfaction, openness and college adjustment are important predictors of persistence among Asian, Black and White freshmen. For Hispanics none of the model's variables appear related to persister status.

A preponderance of the research has shown that Blacks have a higher rate of attrition than whites (Bennet and Bean, 1984, MacKinney and Allen, 1982, Pascarella, Smart, and Ethington, 1986). Lenning, Beal and Sauer (1986) reported that Blacks have a higher rate of attrition even when high school academic ability is controlled. The study conducted by Lichtman, Bass and Ager (1989) at an urban commuter university supports the research that Blacks have a higher rate of attrition than whites. In the Lichtman study 57%of the Blacks dropped out; by contrast,

38% of the whites left during the same time studied. In support of Lenning, et. al., the study found that for each high school GPA category, i.e., below 3.25 and above 3.25, the dropout rate for blacks is significantly higher. In considering college grade point average, the study found that Blacks and whites performing below 3.0 dropped out at about the same rate; however, above 3.0 Blacks dropped out 2.37 to 3.47 for every white who left. At every level of the ACT Blacks dropped out at a higher rate than whites (Lichtman, Bass & Ager, 1989).

Bean and Metzner (1985) hypothesized that students who commute are less affected by the social integration variables in Tinto's Student Integration Model and more affected by academic integration variables and academic outcomes, namely college GPA. The findings of the Lichtman, Bass and Ager study appear inconsistent with this hypothesis. Blacks with higher GPAs (3.0 and above) dropped out at a greater rate than whites with the similar GPA, whereas Black students and white students with GPAs less than 3.0 dropped out at the same rate. This finding has not been reported in previous research (Lichtman, Bass and Ager, 1990).

Consistent with the research of Bennett and Okinaka (1990) and Lichtman, Bass and Ager (1989), are the findings of Smedley, Myers. and Harrell (1993). These researchers hypothesized that minority status stress conferred an additional risk for poor college adjustment for minority students. Given that all college freshman experience the stress of financial problems, pressures from home, conflicts with faculty and peers, Smedley, et. al., propose that these pressures are compounded for Black students on white campuses because of their sense of alienation in the collegiate environment. This burden of added stress would contribute to negative outcomes for Black students.

The results of the study confirmed the hypothesis. The results indicated that chronic student role strains and life event stresses are important correlates of psychological distress for minority freshmen and that minority status stresses contributed substantially to this correlation. The study supported previous research on minority freshmen that showed

psychological distress, regardless of sources, was not as important as academic aptitude, i.e., prior academic preparation and performance in explaining current academic achievement. However, the significant association of minority status-related achievement stresses with lower GPA suggests that conflicts between academic expectations and questions about readiness to compete academically are important additional sources of academic vulnerability for minority students. The students in this study evidenced considerable psychological sensitivity and vulnerability to the campus climate, to interpersonal tensions between themselves and white students and faculty, and to experiences of actual and perceived racist attitudes (Smedley, Myers, & Harrell, 1993).

The study also confirmed the intuition that minority-status stress heightened freshman anxiety over academic preparedness, sense of legitimacy as an university student, and perceptions of white students and faculty. This heightened concern reflected a sensitivity to the stigmatized "special status" of a student admitted under an affirmative action program and interfered with the student's ability to bond with the university (Smedley, Myers, & Harrell, 1993).

Theoretical Framework

The theoretical framework which motivated the choice of predictors investigated in this study is described by the flow chart in Figure 1. The persistence decision is an outcome of a complex sociological and psychological process of academic and affective socialization interacting with institutional characteristics as well as with personal background and individual characteristics. The persistence decision is determined by four conceptual variables: academic outcomes, social/psychological outcomes, institutional effectiveness, and background variables external to the institution and preceding student's initial enrollment. Academic outcomes are a product of

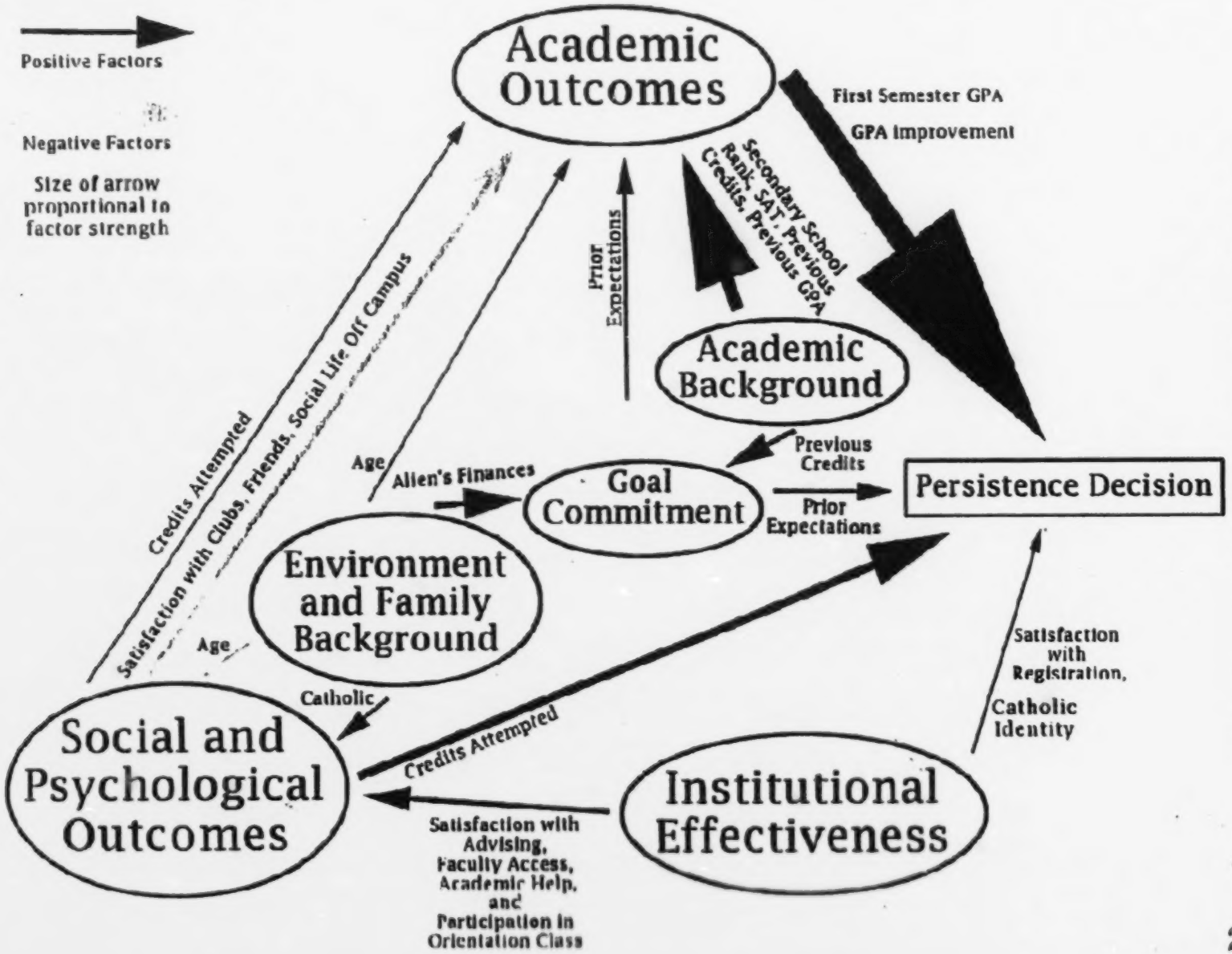

FIG. 1. Theoretical Model of First-Year Student Persistence

Methodology

Introduction to Logit Regression

Ordinary least squares (OLS) regression is not appropriate for analyzing the determinants of a dichotomous dependent variable (Y) like retention. Two problems stand out. First, the required assumption that the error terms have constant variance is untenable. If the expected value of Y is close to 1, then the error terms will all be large (if observed Y=0) or small (if observed Y=1). All the error terms will be approximately 0.5 if the expected value of Y is close to 0.5. Consequently, while the estimated OLS coefficients would be unbiased, the standard errors would be incorrectly estimated. Second, any linear model eventually predicts values of Y greater than 1 or less than 0, impossible predictions since the dependent variable is interpreted as the probability of retention. The function estimated should approach the (0,1) boundaries asymptotically.

Logit regression[1] overcomes these problems by transforming the dependent variable. Let P be the probability that the student is retained. The odds favoring retention are: $P / (1-P)$. For the sample of students analyzed in this paper P=0.74 so the odds or retention are 2.8 or nearly 3 to 1. By taking the natural logarithm of the odds, we obtain a logit: $L = \log_e(P / (1-P))$. Logit regression refers to models with a logit as the dependent variable:

$$L_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_{K-1} X_{i,K-1}$$

Since the logit is a linear function of the predictors (X variables), the probability of retention is a nonlinear S-shaped function like that in Figure 2. Since the logit function is flattest near the extremes, it reflects the intuitive notion that marginal changes in predictors will have the least impact when the probability of persistence is near 0 or 1. Consequently, the impact of any single retention factor is dependent upon the values of the other factors which jointly determine the position on the S-shaped curve.

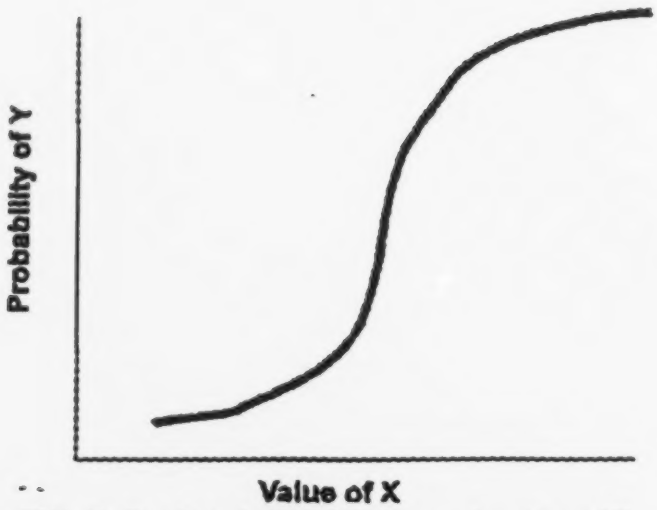

FIG. 2. Predicted probability as a function of X

Logit models are estimated by maximum likelihood rather than by least squares. Maximum likelihood methods ask, "What parameter values make this sample most likely?" Logit regression techniques assume that (1) the model is correctly specified as a linear function of the X variables, which are measured without error, (2) the observations are independent, and (3) none of the X variables are linear functions of the others. If these conditions are met, the maximum likelihood estimates of the parameters are unbiased, minimum variance, and normally distributed in large samples.

The coefficient, β_j, tells us how much the logit increases for a unit increase in X_j. However, the probability of retention is a nonlinear function of the logit, making it difficult to interpret the coefficients in terms of the impact of the predictors on the probability of retention. One interpretation of the coefficient, β_j, is that each unit increase in X_j multiplies the odds favoring retention by e^{β_j} if all the other X's stay the same. e^{β_j} is called the **odds ratio** and is often used comparatively to describe the strength of an effect. The stronger the relation between X and retention, the farther the odds ratio will be from 1—greater than 1 if increases in X encourage retention and less than 1 if increases in X discourage retention.

Alternatively, we can describe the effect of X in terms of probabilities rather than odds. The effect of X_j on the probability of retention depends on the values of the other X's and has the least effect when the predicted probability is near 1 or 0. The effect of a unit change in X_j on the predicted probability of retention, under the assumption that the other X's are at their mean values, is reported in this paper as the delta–p statistic (see Peterson, 1984). The delta–p statistic measures the strength of the effect of X_j on the predicted probability of retention.

Goodness-of-fit measures are less easy to interpret than with OLS regression. **McFadden's Rho-squared** is a transformation of the likelihood ratio statistic which tests the hypothesis that all coefficients except the constant are zero. It is intended to mimic an R-squared in that it is always between 0 and 1, and a higher Rho-squared corresponds to a better fit. However, it tends to be much lower than R-squared with values between 0.2 and 0.4 considered very satisfactory.

The success of the model in classifying students can be judged by the proportion of the sample for which the retention decision is correctly predicted. The **success index** is the gain the model shows over a purely random model which assigns the same probability of retention (the sample mean) to every student in the sample. The smaller the success index, the poorer the performance of the model.

Finally, the model must be judged by the extent to which the estimated parameters are not unduly influenced by a handful of unusual observations. Cook's D helps us make this judgement for each X pattern by measuring the standardized change in all estimated parameters together that results from deleting all cases with that X pattern. The parameter estimates in this study were improved by deleting 12 "high influence" observations out of a sample of 2850

Data Sources

Data were gathered for nearly 3,000 new undergraduate students who entered the university between the Fall term 1991 and the Spring term 1995. The sample includes full–time (83% of sample) and part–time students, transfer(60%) and first–time in college students, commuter (70%) and residential students, but it excludes students enrolled exclusively in the adult degree program or the weekend programs in physical or occupational therapy. The average age was 24 and the sample contained 67% Florida residents, 65% women, 53% minority students and 28% resident aliens or international students. Seventy one percent of the students received financial aid from some source in the first year. The analysis focuses on student persistence into the second year at Barry, which is not necessarily the student's sophomore year[2] or second year in college. Students are defined as a persisters if they are enrolled three terms after the initial enrollment or have graduated from Barry. A very small number of students who "stop–out" but returned during the time frame of this study were coded as persisters.

Data used to predict persistence come from three sources. The students' admissions records yield demographic information, standardized test scores, and data on academic performance at previous institutions. The students' academic record at Barry yields grades, credits attempted, and credits transferred from previous college level work. The final source is survey data on the students' perceptions of their subjective experiences Two surveys were given to first-year students. During orientation, before classes begin, students were given the Cooperative Institutional Research Program survey developed by the Higher Education Research Institute. This survey yielded data on prior expectations of graduation and family educational background with an average response rate of 36%. After approximately six weeks of classes, students were given another survey, developed by the author, which asked for students' perceptions of their

TABLE 2. Definition of Variables

Variable	Definition
ACADhlp	Five point scale indicating the extent to which "opportunities outside of class to receive help with academic problems" meets expectations
ACCESS	Five point scale indicating the extent to which the student agrees "faculty are accessible to students, not only through office hours, but elsewhere on campus"
ADVISING	Five point scale indicating the extent to which "the quality of advice and information I received about course selection and course requirements" meets expectations
AGE	Student's age at matriculation
ALIEN	1 if resident alien, 0 if not
ANGLO	1 if white non-Hispanic, 0 if not
ATTEMPT	Number of credits attempted in first semester
BLACK	1 if Black or Black Hispanic, 0 if not
CATHOLIC	1 if self-identified Catholic, 0 if not
CLUBS	Five point scale indicating the extent to which "opportunities to participate in clubs and organizations on campus" meets expectations
EXPECT	Five point scale indicating the extent to which the student agrees "I expect to receive my degree from Barry University"
FINCDIF	Five point scale indicating the extent to which the student agrees "I am concerned that financial difficulties may affect my ability to stay at Barry"
FRNDS	Five point scale indicating the extent to which the student agrees "I am finding some of my best friends here at Barry"
FULLTIME	1 if student enrolled for 12 or more credits in first semester, 0 if not
GPA1	Student's GPA after first semester
GPA21	Student's cum GPA after second semester minus student's GPA after first semester
INTRNL	1 if international student, 0 if not
NOprevCRD	1 if student received no transfer credits from any source, 0 if not
ORI100	1 if student enrolled in Orientation Course, 0 if not
prevCRD	1 if no transfer credits, 2 if 60 or fewer transfer credits, 3 if more than 60 transfer credits
prevGPA	Student's GPA from high school or previous college(s)
READING	Average placement test score for English language reading
REGISTRA	Five point scale indicating the extent to which "the registration process" meets expectations
SAT	Student's SAT score
SOCoff	Five point scale indicating the extent to which "social opportunities off campus" meets expectations
ssRANK	Student's rank in secondary school
TRANSFER	1 if 15 or more transfer credits or grades reported from previous college, 0 if not
US	1 if United States citizen, 0 if not

experience at Barry. With a follow-up mailing, the response rate on this survey averaged 39%. Since not all questions were asked each year, the sample size may vary for different questions as shown by the descriptive statistics in Table 2. All the variables defined in Table 1 are statistically significant.

TABLE 2. Descriptive Statistics for Variables

Variable	Sample Size	Mean	Standard Deviation
ACADhlp	1001	2.297	0.921
ACCESS	923	2.275	0.997
ADVISING	1028	2.622	1.034
AGE	3494	23.774	7.259
ATTEMPT	3513	13.425	3.805
CLUBS	975	2.625	0.866
EXPECT	1029	1.895	1.079
FINCDIF	841	2.710	1.323
FRNDS	425	2.214	1.032
GPA1	3330	2.840	0.920
GPA21	2481	-0.029	0.372
prevCRD	3285	32.555	30.083
prevGPA	2741	2.830	0.585
READING	1496	12.988	2.745
REGISTRA	1030	3.081	1.061
SAT	2405	868.598	156.915
SOCoff	956	2.748	0.993
ssRANK	880	0.351	0.256

Model Specification

Missing observations for some of the variables was a problem in specifying the model. Table 2 shows that some of the variables, especially survey results, were available for only part of the sample. In order to get the best estimates for coefficients, the first round of estimation included only variables that were available for essentially the whole sample. For a second round of estimation, the coefficients for the first round were "locked in" by creating an artificial variable which was a linear combination of the statistically significant variables from the first round. A

limitation of this strategy is that variables introduced in a subsequent round could not fully "compete" with variables from an earlier round for explanatory power, but this limitation is outweighed by the value of estimating coefficients from the largest available sample.

For two variables missing values were replaced by estimated values from a linear regression. The variable GPA21 shows academic achievement "momentum" by taking the difference between the cumulative GPA after the second semester and the first semester GPA. This variable was estimated for 71 students (2.5% of sample) who left after only one semester. EXPECT was estimated for 1813 students (64% of sample!) because prior expectations of graduation is a retention factor that theoretically precedes in time factors reflecting the students' experience of this institution. Consequently, it was vital that this variable be entered in the first round of analysis to give it the fullest chance for explanatory power. Estimated values of the variable were used so that the sample size would not be dramatically reduced in the first round of analysis. This decision may be criticized because there is self–selection bias in the subsample of students who reported prior expectations. One indication is their attrition rate was 6% lower.

Results

Table 4 shows the results of the logit regressions that were used to estimate the direct impact of retention factors on persistence The odd's ratio shows that first–semester GPA has a far greater impact on the odds of retention than any other factor. As one measure of the goodness–of–fit this logit regression classified 78% of the students correctly in contrast to a purely random model that would have classified 65% of the students correctly. Note that Black students have 50% greater odds of persistence, assuming all other factors being equal. Table 5 shows that this assumption is not viable for Black transfer students whose GPA is 0.3 lower

after controlling for other determinants. For international students, their English reading ability is a modest retention factor. Note that this factor operates directly on the odds of retention rather than indirectly through an impact on GPA, as might be expected. Perhaps international students can compensate for weak reading skills in terms of their first semester grades, but the extra effort and stress reduces the odds of persistence. Financial concerns reduce the odds of retention only for resident aliens. In our environment these are mostly Cuban and

TABLE 4. Logit Regression Results for First-Year Retention

Independent Variable	Coefficient	Odd's Ratio
First round of variable entry N=2838		
Square root of GPA1	3.0046***	16.35'
GPA21	1.3924***	1.65'
ATTEMPT	0.1207***	1.44
NOprevCRD	-0.6327***	0.53
CATHOLIC	0.3958**	1.49
BLACK	0.3899**	1.48
EXPECT	0.4442***	1.39'
ORI100	0.5306***	1.70
AGE	-0.0230**	0.89
Second round of variable entry N=1484		
READING*INTRNL	0.0613***	1.21'
Third round of variable entry N=588		
REGISTRA	0.2251*	1.28'
FINCDIF*ALIEN	-0.2817*	0.68'

*p≤.05; **p≤.01; ***p≤.001 one-tail test ' odd's ratio adjusted for unit change of one standard deviation

Haitian immigrants. Since aliens receive financial aid in nearly the same proportion as U.S. citizens (72% vs 75%) and on average receive larger awards after controlling for income, this may be a cultural phenomenon more than an objectively financial one.

For statistically significant predictors of GPA1, indirect impacts were estimated from ordinary least squares coefficients given in Table 5. The size of the standardized coefficients give the best estimate of the relative impact of each variable on GPA. The significant negative

TABLE 5. OLS Regression Results on First Semester GPA

Independent Variable	Coefficient	Standardized Coefficient
First round of variable entry: N = 1875, R^2 = 0.29, Standard error of estimate = 0.77		
prevGPA	0.4258***	.28
prevCRD	0.1994***	.16
SAT	0.0010***	.16
EXPECT	0.1876***	.16
FULLTIME	0.4162***	.13
TRANSFER*BLACK	-0.2900***	-.09
TRANSFER*nonBLACK	0.1308**	.07
AGE	0.0177***	.09
Second round of variable entry N=717, R^2 = 0.29, Standard error of estimate = 0.74		
ssRANK	0.2975*	.09
Another second round N = 632, R^2 = 0.32, Standard error of estimate = 0.67		
CLUBS	-0.1126***	-.12
ACADhlp*nonANGLO	0.0626**	.09
FRNDS	-0.0968**	-.09
ADVISING	0.0631*	.08
SOCoff	-0.0586*	-.07
Third round of variable entry N = 511, R^2 = 0.33, Standard error of estimate = 0.65		
ACCESS*US	0.0388*	.06

*p≤.05; **p≤.01; ***p≤.001 one–tail test

GPA differential for transfer students between Blacks and other ethnicities is disturbing and unexplained by this analysis. One speculation is that this effect is a function of the "quality" of the schools from which Black students are likely to transfer. Satisfaction with opportunities to

receive academic help outside of class has a modest impact on grades only for minority students. Only for U.S. citizens does the accessibility of the faculty outside of class and office hours have an impact on grades. This may suggest that the mentor relationship with faculty members is an expectation unique to American citizens. Since the distribution of responses was similar for citizens and non–citizens, this evidence is suggesting that citizens are not more satisfied with faculty mentoring—they are just more affected. An interesting result is the negative impact on grades (equal for all ethnic groups) of some of the factors that lead to social and psychological integration—CLUBS, FRNDS, and SOCoff.

Table 6 provides the best summary of the relative impact of individual retention factors. The logit model improves our ability to correctly classify students (persistence vs. attrition) to 78% from the 65% correct for a purely random model. The first column shows how much of this "improvement" is attributable to each variable. For instance, more than half the model's ability to improve prediction or classification of students' persistence/attrition status comes from the contribution of GPA1.

The next three columns estimate the impact of a unit change in the predictor on the probability of retention, i.e. the delta–p statistic. Direct, indirect, and total impacts are shown. Since predictors are not measured in comparable units, these estimated impacts cannot be directly compared without adjustments. The last column shows the unit of change for each variable. In many cases they are made roughly comparable by using one standard deviation while in other cases a "natural" unit was used, like 3 credits constituting a single course. When the retention factor is dichotomous, the column is left blank. In general both a variables impact

TABLE 6. Factors Increasing First Year Retention

Retention Factor	Contribution to Model's Predictive Success	Impact on Probability of Retention Direct Impact	Thru 1st Semester GPA	Total Impact	Unit of Change
Higher first semester GPA	53.9%	0.41***		0.41	.92†
GPA improves 1st to 2nd semester	13.6%	0.07***		0.07	0.35†
More credits attempted in 1st semester	9.9%	0.05***	0.04***	0.09	3 credits
Prior expectation of graduation	7.3%	0.05***	0.06***	0.11	0.74†•
Aliens with less financial concerns	5.7%	0.05*		0.05	1.34†•
Intrnl students' English reading skill	5.1%	0.03***		0.03	3.14†R
No previous college credits	4.0%	-0.09***	-0.08***	-0.18	
Higher GPA at previous institution(s)	3.8%		0.11***	0.11	0.58†
Participant in orientation course	2.5%	0.08***		0.08	
non-Black transfer students	1.8%	-0.06**	0.10**	0.04	
Black transfer students	1.6%	0.06**	-0.10**	-0.04	
Satisfaction with registration process	1.6%	0.03*		0.03	1.06••
Age	1.5%	-0.02**	0.04***	0.02	5 years
Black freshmen	1.4%	0.06**		0.06	
Catholic students	1.3%	0.06**		0.06	
Satisfaction with opportunities to participate in clubs & organizations	0.6%		-0.04***	-0.04	0.87†•
Higher SAT	0.6%		0.07***	0.07	157†
Minority students satisfaction with opportunities for academic help	0.5%		0.03**	0.03	0.92†•
Agrees with "finding some best friends at Barry"	0.4%		-0.04**	-0.04	1.03†•
Satisfaction with academic advising	0.3%		0.03*	0.03	1.03†•
Satisfaction with social opportunities off campus	0.2%		-0.03*	-0.03	0.99†•
US citizen's experience that faculty are accessible elsewhere on campus	0.2%		0.02**	0.02	1.00†•
Secondary school class rank	0.2%		0.01*	0.01	1 decile

*p≤.05; **p≤.01; ***p≤.001 one–tail test † represents one standard deviation

• survey response on a 5 point scale R on a reading grade level scale

on the probability of retention and its contribution of the model's predictive power give a similar impression of the factor's "strength." Occasionally a factor appears to be out of line. For instance, because resident aliens' financial concerns have a relatively high variability, the variable makes a relatively large contribution to the model's predictive power even though its impact on the probability of retention is more modest.

Conclusions and Implications

Taken together variables interacting with ethnicity or citizenship contribute less than 7% of the model's total predictive power. For comparison, academic background variables together contribute 12% and academic outcomes account for 81%. Clearly differences of ethnicity and citizenship play only a modest role in our efforts to understand the forces that determine persistence and attrition. Table 7 displays all the statistically significant retention factors by the ethnic and citizenship groups to which they apply. It is perhaps reassuring that students from different ethnic groups respond more similarly than differently to the collegiate environment. This suggests that, for the most part, uniform retention strategies are likely to be equally effective across ethnic and citizenship groups.

One exception is that the availability of opportunities for academic help outside of class is especially important for minority students. Perhaps the staffing of learning and writing centers on campus should make those services especially friendly and attractive to minorities without stigmatizing them. Finally, additional research is called for to understand the apparent disadvantage of black transfer students at our university.

Ethnic and citizenship groups are not unifromly defined across the country. Here Hispanics are Cubans not Mexican–Americans and Black aliens are probably Hatians while Black international students are more likely to be from Jamaica or the Bahamas. These "micro"

differences in ethnicity point out the limited utility of ethnic categories in the first place, and they suggest that each campus may need to replicate this type of research for its own environment and its own ethnic and citizenship mix. At the very least, this research will help us improve access to education and equal treatment for all cultures.

TABLE 7. Factors Improving First–Year Retention by Ethnic and Citizenship Groups

Citizenship / Ethnic	All citizenship groups	U.S. citizens	Resident aliens	International Students
All ethnic groups	➢ higher GPA ➢ some previous college credits ➢ prior expectation of graduation ➢ more credits attempted in 1st semester ➢ participation in orientation course ➢ 2nd semester improvement in GPA ➢ self-identified Catholic ➢ satisfaction with registration process • higher GPA at previous institution • higher SAT • dissatisfaction with opportunities to participate in clubs & organizations •➢ older at time of matriculation • satisfaction with academic advising • disagrees with "finding some of my best friends at Barry" • dissatisfaction with social opportunities off-campus	• satisfaction with access to faculty in addition to class and office hours 73% retention 72% of sample	➢ no concerns about financial difficulties 76% retention 13% of sample	➢ higher English language reading achievement score 77% retention 15% of sample
Anglos 76% retention	• transfer student 47% of sample	73% retention 61% of sample	1% of sample	88% retention 5% of sample
Hispanics 78% retention	• transfer student • satisfaction with opportunities for academic help outside of class 27% of sample	74% retention 20% of sample	79% retention 5% of sample	72% retention 4% of sample
Blacks 74% retention	• first-time in college • satisfaction with opportunities for academic help outside of class 20% of sample	71% retention 9% of sample	75% retention 6% of sample	81% retention 5% of sample

➢ factors marked with this bullet have a direct impact on the probability of first year retention

• factors marked with this bullet have only an indirect impact on retention through their impact on first semester GPA

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Endnotes

1. The Systat Logit module was used for this analysis.

2. Students transferred an average of 33 credits from previous college level work.